Electronic Version
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Claims

[c1] 1.Solid oxide fuel cell with internal reforming capability comprising:

a cathode;

an anode;

electrolyte disposed between the anode and the cathode;

a cathodic current collector;

an anodic current collector, the cathode, anode and electrolyte disposed between the cathodic current collector and the anodic current collector;

a cathodic interconnect electrically connecting the cathode to the cathodic current collector, the cathodic interconnect comprising a metallic substrate providing a flow field between the cathode and the cathodic current collector for oxygen containing gas flow over at least a portion of the cathode; and

an anodic interconnect electrically connecting the anode to the anodic current collector, the anodic interconnect comprising a metallic substrate providing a flow field between the anode and the anodic current collector for fuel gas flow over at least a portion of the anode and a catalytic coating on the metallic substrate comprising a catalyst for catalytic conversion of the hydrocarbon fuel

in the fuel gas to hydrogen rich reformate.

[c2] 2.Solid oxide fuel cell as in claim 1 wherein the metallic substrate of the anodic interconnect includes a first uncoated portion electrically connected to the anode, a second uncoated portion electrically connected to the anodic current collector, and a spacing portion extending between the first and second uncoated portions for spacing the anode from the anodic current collector and forming the space for the fuel gas flow.

[c3] 3.Solid oxide fuel cell as in claim 1 wherein the metallic substrate of the anodic interconnect is formed of high temperature stainless steel/alloy plate.

[c4] 4.Solid oxide fuel cell as in claim 2 wherein the metallic substrate of the anodic interconnect has an offset plate fin or dimple configuration.

[c5] 5.Solid oxide fuel cell as in claim 4 wherein the metallic substrate of the anodic interconnect includes a plurality of rows of fins having a square wave shaped cross-section, adjacent rows of the plurality of rows of fins being offset from one another.

[c6] 6.Solid oxide fuel cell as in claim 1 wherein at least a portion of the anode is unobstructed by the anodic interconnect.

[c7] 7.Solid oxide fuel cell as in claim 1 wherein the catalytic coating further comprises a catalyst support and a catalyst promoter.

[c8] 8.Solid oxide fuel cell as in claim 1 wherein the catalyst is a steam reforming catalyst.

[c9] 9.Solid oxide fuel cell as in claim 8 wherein the steam reforming catalyst comprises a transition metal or a precious metal.

[c10] 10.Solid oxide fuel cell as in claim 8 wherein the steam reforming catalyst comprises a transition metal or a precious metal, the catalyst support comprises a refractory metal oxide, the promoter comprises an alkali metal oxide or an alkaline earth metal oxide.

[c11] 11.Solid oxide fuel cell as in claim 1 wherein the electrolyte is a solid electrolyte.

[c12] 12.Solid oxide fuel cell as in claim 11 wherein the solid electrolyte comprises yttria-stabilized zirconia.

[c13] 13.A catalyzed anodic interconnect for electrically connecting an anode and an anodic current collector in a fuel cell comprising a metallic substrate providing space between the anode and the anodic current collector for fuel gas flow over at least a portion of the anode and a

catalytic coating on the metallic substrate comprising a catalyst for catalytic conversion of hydrocarbon fuel in the fuel gas to hydrogen rich reformate.

[c14] 14.A catalyzed anodic interconnect as in claim 13 wherein the catalyst is a steam reforming catalyst.

[c15] 15.Method for operating a solid oxide fuel cell comprising feeding an oxygen containing gas adjacent a cathode in the solid oxide fuel cell and feeding a hydrocarbon fuel through a fuel flow path in the solid oxide fuel cell, the fuel path bounded at least in part by an anode, an anodic current collector, and a catalyzed anodic interconnect electrically connecting the anode and the anodic current collector, the catalyzed anodic interconnect comprising a metallic substrate providing space between the anode and the anodic current collector for fuel gas flow over at least a portion of the anode and a catalytic coating on the metallic substrate comprising a catalyst for catalytic conversion of the hydrocarbon fuel in the fuel gas to hydrogen rich reformate.

[c16] 16.A catalyzed anodic interconnect as in claim 15 wherein the catalyst is a steam reforming catalyst.

[c17] 17.Method for making a catalyzed anodic interconnect for use in a solid oxide fuel cell comprising:

providing a metallic substrate configured to provide space between an anode and an anodic current collector in the solid oxide fuel cell for fuel gas flow over at least a portion of the anode;
pretreating a surface of the metallic substrate to increase the hydrophilicity of the metallic substrate;
coating the metallic substrate with a catalytic coating comprising a catalyst for catalytic conversion of hydrocarbon fuel to hydrogen rich reformate.

[c18] 18.Method as in claim 17 wherein the step of coating comprises coating the metallic substrate with an aqueous mixture comprising water, a catalyst precursor, a catalyst support, a catalyst promoter, and a binder, drying the aqueous mixture on the metallic substrate, and thereafter calcining the metallic substrate.

[c19] 19.Method as in claim 17 wherein the step of coating comprises coating the metallic substrate with an aqueous mixture comprising water, a catalyst support, a catalyst promoter, and a binder, drying the aqueous mixture on the metallic substrate, calcining the coated metallic substrate, applying to the coated metallic substrate a solution including a catalyst precursor, and drying the solution on the coated metallic substrate, and calcining the coated metallic substrate to convert the catalyst precursor to the catalyst.

[c20] 20.Method as in claim 17 wherein the catalyst is a steam reforming catalyst.